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ABSTRACT

Schema theorists have advanced the understanding of reading comprehension by describing how prior knowledge can enhance a reader's interaction with the text. Accordingly, comprehension occurs when a reader is able to use prior knowledge and experience to interpret a text's message. Educators and researchers have suggested numerous instructional strategies to help students activate and use prior knowledge to aid comprehension. In order for schema construction to occur, a framework must be provided that helps readers elaborate upon new facts and ideas to clarify their significance or relevance. (RS)

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Schema Activation, Construction, and Application

by Marino C. Alvarez and Victoria J. Risko

Readers rely on their prior knowledge and world experience when trying to comprehend a text. It is this organized knowledge that is accessed during reading that is referred to as schema (plural schemata). Readers make use of their schema when they can relate what they already know about a topic to the facts and ideas appearing in a text. The richer the schema is for a given topic the better a reader will understand the topic.

Schema theorists have advanced our understanding of reading comprehension by describing how prior knowledge can enhance a reader's interaction with the text. Accordingly, comprehension occurs when a reader is able to use prior knowledge and experience to interpret an author's message (Bransford, 1985; Norris & Phillips, 1987). Educators and researchers have suggested numerous instructional strategies to help students activate and use prior knowledge to aid comprehension. Yet, schema theory does not explain how readers modify and create new schema when presented with novel information in texts.

Schema Activation:

Because texts are never completely explicit, the reader must rely on preexisting schemata to provide plausible interpretations. Yet, there is much evidence that good and poor readers do not always use schemata appropriately or are unaware of whether the information they are reading is consistent with their existing knowledge. Also, there is evidence that students who do not spontaneously use schemata as they read will engage them if given explicit instructions prior to reading (e.g., Bransford, 1979).

Prereading strategies have been developed to help students relate new information appearing in written discourse to their existing knowledge. The design of many of these preorganizers reflects Ausubel's (1959) definition of readiness and the purpose of their use is to create a mind set prior to reading. These preorganizers have included advance organizers (Ausubel, 1960), structured overviews or graphic organizers (Alvermann, 1981), previews (Graves, *et al.*, 1983), concept maps (Novak & Gowin, 1984), and thematic organizers (Alvarez, 1980, 1983; Alvarez & Risko, 1989; Risko & Alvarez, 1986).

Schema Construction and Application:

Learning novel concepts may require the reader to connect new information to a congruent mental model. Mental models represent an individual's construal of existing knowledge and/or new information in the domain even though this information may be fragmentary, inaccurate, or inconsistent (Gentner & Gentner, 1983). A person's mental model is a representation of a particular belief based on existing knowledge of a

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physical system or a semantic representation depicted in a text. For example, a person may hold a belief that balls are round, inflatable and are made to bounce. However, this person may encounter a football (an ellipsoid) that is kicked or thrown, or ball bearings that are solid, or a bowling ball that is solid and has holes drilled into it for the purpose of rolling rather than bouncing. This new knowledge is integrated into a new, more complex, mental structure about the shape, substance, form, and function of balls.

As Bransford (1985) points out, schema activation and schema construction are two different problems. While it is possible to activate existing schemata with a given topic, it does not necessarily follow that a learner can use this activated knowledge to develop new knowledge and skills. Problem solving lessons and activities can provide learners with situations that aid in schema construction which includes critical thinking. Critical thinking theory enables a reader to analyze an ambiguous text. When versed in this process, a reader can either weigh alternative interpretations, dismiss others, make a decision to evaluate multiple possibilities, or accept the information as being reasonable. This process helps students to modify or extend their mental model, or existing knowledge base, for target concepts.

Several teacher-directed and self-initiated activities can be used to promote schema construction and application of knowledge to novel situations. Four such strategies that are designed to foster shared meaning between and among teachers and peers are: cases, interactive videodiscs, hierarchical concept maps, and Vee diagrams.

Cases that present learners with single and varied contexts across disciplines provide learners with scenarios that can be discussed and analyzed from multiple perspectives (e.g., see Christensen, 1987; Spiro, *et al.*, 1987). These cases can include written documents, recorded (musical as well as narrative) interludes, paintings, artifacts, video portrayals, and other pertinent substances and materials. Another teacher-directed strategy is the use of interactive videodiscs. Bransford and his colleagues are developing episodes, revolving around problem-oriented learning environments, that can be computer-accessed by learners to invite critical thinking and schema construction (see Bransford, *et al.*, 1989; Bransford, *et al.*, in press).

Hierarchical concept maps and Vee diagrams are two methods that students can initiate on their own for schema construction and application. Hierarchical concept maps (Novak & Gowin, 1984) are designed to help the reader clarify ambiguities of a text while simultaneously revealing any misconceptions that result from a reading. More importantly they provide the learner with a tool from which to initiate ideas that can be shared by visual inspection with someone else. The Vee diagram (Gowin, 1981/1987) is a method by which a learner can learn about the structure of knowledge and knowledge-making within a given discipline and use this knowledge in novel contexts.

Students can be taught to incorporate new information into their existing world knowledge. This can be accomplished through teacher guided instruction and self-initiated strategies that includes methods and meaningful materials that induce critical thinking with conceptual problems. In order for schema construction to occur, a framework needs to be provided that helps readers to elaborate upon new facts and ideas and to clarify their significance or relevance. Students need to learn more about themselves as learners. Notable in this learning context is the relationship between facts and ideas learned in formal school settings and those encountered in everyday learning environments. Perhaps within this inquiry we will be led to discover the ways individuals choose to relate new information to existing schemata and how this new information influences their future knowledge and decision-making.

Additional material on schemata can be found in the ERIC database. Some recent articles are:

Anstey, Michele. "Helping Children Learn How to Learn," *Australian Journal of Reading*, 11 (4) November 1988, p. 269-77. [EJ 383 664]

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Mealey, Donna L. and Nist, Sherrie L. "Postsecondary, Teacher Directed Comprehension Strategies," *Journal of Reading*, 32 (6) March 1989, p. 484-93. [EJ 383 759]

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